US010408752B2

(12) **United States Patent**
Wang et al.

(10) **Patent No.: US 10,408,752 B2**
(45) **Date of Patent: Sep. 10, 2019**

(54) **PLASMONIC SENSOR**

(71) Applicant: **National Taiwan University**, Taipei (TW)

(72) Inventors: **Cheng Wang**, Taipei (TW); **Li-Wei Nien**, Taipei (TW); **Chun-Hway Hsueh**, Taipei (TW); **Hsin-Chia Ho**, Taipei (TW); **Yi-Chen Lai**, Taipei (TW)

(73) Assignee: **National Taiwan University**, Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/716,518**

(22) Filed: **Sep. 27, 2017**

(65) **Prior Publication Data**

US 2018/0106721 A1 Apr. 19, 2018

Related U.S. Application Data

(60) Provisional application No. 62/409,839, filed on Oct. 18, 2016.

(51) **Int. Cl.**
G01N 21/43 (2006.01)
G01N 21/25 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G01N 21/43*** (2013.01); ***G01N 21/25*** (2013.01); ***G01N 21/554*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G01N 21/55; G01N 21/658; G01N 29/34; G01N 29/2418; G01N 33/54373;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,629,213 A * 5/1997 Kornguth B82Y 30/00 356/445
6,278,540 B1 * 8/2001 Wang G02F 1/315 359/245

(Continued)

FOREIGN PATENT DOCUMENTS

CN 103805920 5/2014
JP 2002131319 A * 5/2002
TW I237346 8/2005

OTHER PUBLICATIONS

Cheng Wang et al., "Viscous flow and viscosity measurement of low-temperature imprintable AuCuSi thin film metallic glasses investigated by nanoindentation creep," Materials & Design, vol. 123, Jun. 5, 2017, pp. 112-119.

(Continued)

Primary Examiner — Sang H Nguyen
(74) *Attorney, Agent, or Firm* — JCIPRNET

(57) **ABSTRACT**

A plasmonic sensor includes at least a substrate and a thin film metallic glass formed on the substrate. The dielectric constant (ε_r) of the thin film metallic glass is negative. Since the thin film metallic glass with negative ε_r is used in the plasmonic sensor, the material cost can be significantly reduced, the mechanical property can be improved, and the optoelectronic property can be increased. Since the thin film metallic glass is a kind of supercooled alloy with amorphous structure, it can be applied for imprinting deformation and amorphous without grain boundary scattering.

9 Claims, 7 Drawing Sheets